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"Phase III – Mercury Control Technologies for Utilities Burning Lignite Coal: Full-Scale Evaluation of Long-Term Balance-of-Plant Effects Resulting from Activated Carbon Injection"

Contractor: Energy & Environmental Research Center (EERC)

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PARTICIPANTS

Sponsor		Cost Share
U.S. DOE		$ 270,703
SaskPower		$ 4,429,297
NDIC		$ 300,000
	Total Cost	$ 5,000,000

Project Schedule – 13 Months
Contract Date – 6/19/07
Start Date – 3/1/07
Completion Date – ~~3/31/08~~
Extended To – 3/31/09

Project Deliverables
Status Reports:
9/30/07 (✓); 12/31/07 (✓)
Final Report: ~~4/30/08 ( )~~
3/31/09 (✓)

OBJECTIVE / STATEMENT OF WORK:
EERC proposes to conduct a yearlong, full-scale test of activated carbon injection upstream of an electrostatic precipitator at SaskPower Poplar River Unit 2 to determine long-term effectiveness for mercury removal and to further evaluate balance of plant impacts.

FINAL REPORT SUMMARY

Purpose of the Project: A consortium of team members led by the Energy & Environmental Research Center (EERC) concluded a project to evaluate the effects associated with long-term use of a commercially available treated activated carbon injection (ACI) for mercury control, one of the most promising approaches to mercury reduction at this time. The project was conducted at SaskPower's Poplar River Power Station. The project provided information on the operation of both the AC delivery skid over a 1-year period of time and the effect that ACI had on Unit 2 plant equipment and operations. A preliminary economic evaluation was also conducted that evaluated costs associated with the cost of ACI and subsequent mercury removal at the rate that was used at Poplar River (~2 lb/Macf). A small effort was made to evaluate how treated ACI affected the suitability of fly ash for concrete use.

Work Accomplished: Treated activated carbon was injected ahead of the air heater at Poplar River Station, a lignite-fired station, for a period of over 1 year. Prior to beginning the tests, a complete examination was made of the unit and several areas of ash deposition were removed. This inspection was repeated during a short outage and again at the end of the project to allow a visual comparison to the pre-test condition. Metal coupons were placed within the ductwork to allow researchers to see erosion activity over the year. In addition, plant personnel monitored the performance of the electrostatic precipitator (ESP), especially for opacity. Fly ash containing activated carbon was evaluated for the amount of air entrainment additive needed to make it suitable for concrete use.

Project Results: Long-term operation of the commercial injection system shows the need for a consistent, diligent monitoring and maintenance regime that includes a planned effort to continuously monitor system operation for spills, leaks, and pluggage; and routine maintenance and replacement of components and/or parts to prevent failures and ensure high reliability. Balance-of-plant impacts downstream of the point of injection were monitored and observed. These included potentials for duct corrosion and erosion, air heater performance degradation and pluggage, ESP performance degradation, and material-handling issues. Based upon the inspection reports and other observations, it does not appear that treated ACI resulted in additional operational issues for the air heater or the ESP. ESP performance was not adversely impacted, with similar particulate removals of 99.7% being achieved for both fly ash and AC. Ash handling and disposal were not adversely affected. While the air entrainment required for use of the fly ash in concrete increased, the fly ash was still judged to be suitable for sale. Although metal coupons did show some erosion it was not considered to be significant and appears to be consistent with normal erosion activity. Some coupons were left in place for future retrieval and analysis under a future undefined project to allow researchers to gauge erosion depth over time.

Potential Applications of the Project: As treated activated carbon becomes the most prevalent choice for reducing mercury emissions for many coal-fired utilities, it is apparent that plant personnel must apply resources to both the regular maintenance of the delivery system and regular, systematic evaluation of the operations and condition of downstream components. Overall, ACI did not appear to have beneficial or detrimental effects on the plant operations. While ACI did affect the fly ash quality, at the low injection rates needed, it would still be suitable for concrete use under today's standards. Economic evaluation shows that, at Poplar River, ACI is a lower-cost solution to installing a fabric filter baghouse for mercury control, although regular replacement costs must be budgeted for the activated carbon delivery system.